THE MIAMI CONSERVANCY BULLETIN

NOVEMBER, 1921

FIG. 329.—LOCKINGTON DAM COMPLETED, SEPTEMBER 28, 1921.

FIG. 330.—THE DIRECTORS AND CONSERVANCY COURT AT TAYLORSVILLE ON SEPTEMBER 19, 1921.
Left to right, upper row: C. O. Shively, assistant engineer, Taylorsville Dam; Judge F. M. Hagan, C. H. Locher, construction manager, Judge R. L. Goudy, Judge A. C. Risinger, Henry M. Allen, Judge J. D. Barnes, J. H. Kimball, construction engineer, Judge O. B. Brown, Judge E. T. Snediker, H. M. Sherwood, superintendent Taylorsville Dam. Lower row: Ezra M. Kuhns, secretary, C. N. Phillips, office engineer, O. N. Floyd, division engineer Taylorsville Dam, Col. E. A. Deeds, H. S. R. McCurdy, division engineer Englewood Dam. Judge Geiger, Judge Wright, Judge Murphy, Judge Hoffman, Judge Jones, and Chas. H. Paul, chief engineer, were not present when the picture was taken.

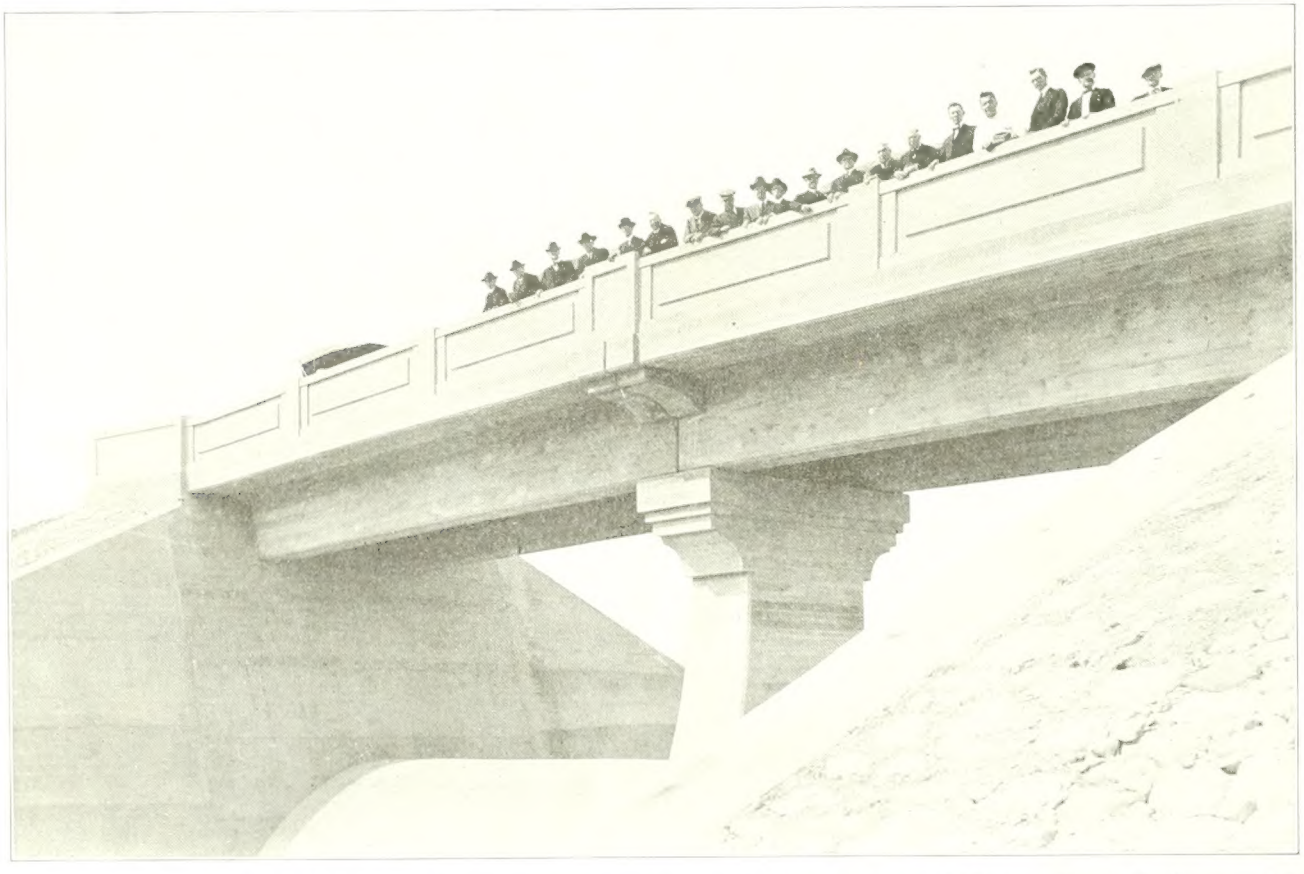

FIG. 331.—THE INSPECTION PARTY ON THE LOCKINGTON SPILLWAY BRIDGE, SEPTEMBER 21, 1921.

THE MIAMI CONSERVANCY BULLETIN

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Index

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Conservancy Court Visits Work

The directors of the Miami Conservancy District conducted a trip of inspection on September 19, 20, and 21, 1921, at which time they were highly honored by the presence of the judges of the Conservancy Court.

The weather was ideal for the purpose and every facility was afforded to make this trip worth while. The whole of the Conservancy works was covered and the judges were able to see the work as a comprehensive whole as well as to inspect and examine what is being done in each locality. Those members of the Court who have been sitting in the Conservancy case from the beginning, particularly appreciated the trip, as they were able to see the practical working out of the principles brought out in the various hearings.

As the work is rapidly reaching completion, it is probable that this will be the last trip undertaken on so large a scale, but it is hoped that the judges may, either in a group or singly, accompany the officers of the District at some later time, on a similar trip. Every one expressed gratification at the protection afforded the Miami Valley by this enormous undertaking.

Mr. Morgan Leaves

On September 1st, Mr. Arthur E. Morgan resigned as chief engineer of the Miami Conservancy District, to devote his entire time to his duties as president of Antioch College and to general engineering work. He first came to the Miami Valley in May, 1913, in response to the urgent request of the Dayton Flood Prevention Committee. His achievements in the development of the flood prevention plan, in the securing of needed legislation, and in enlisting popular support of the proposed work, and finally in the organizing of the forces and equipment to actually carry out the great project, are so well known that they do not need reiterating here. He carries with him the respect and affection of every man in the employ of the District, and carries with him their best wishes for the success of his new undertaking.

He was succeeded as chief engineer by Mr. Chas. H. Paul, who had been assistant chief engineer since November, 1916, and was construction engineer for a year before that. The shift of the duties of chief engineer to Mr. Paul had been in progress for a number of months before Mr. Morgan left, and the actual change did not affect the policy of the District in any way, nor cause any interruption to the construction program.

More Jobs Finished

September saw Lockington dam finished, the second of the five dams to be completed. On October 27th, traffic was turned over the last link of the Ohio Electric relocation that remained uncompleted, and the last of the relocation jobs were disposed of. Other parts of the work are rapidly nearing completion. All of the five dams are ready now to handle another 1913 flood, and by the first of the year will be practically completed.

Lockington Dam

Longest Conservancy Dam Completed in September. Review of Its History.

The Lockington Dam is located one-half mile northwest of the village of Lockington and four miles north of Piqua on Loramie Creek, an important tributary of the Miami River. The creek has a drainage area of 255 square miles above the dam, and is subject to sudden and violent floods. Although the retarding basin provided will benefit the entire Miami Valley in time of flood, the principal effect will be at Piqua and Troy. During a flood equal to that of 1913 it will reduce the flood discharge from Loramie Creek from 33,000 cubic feet per second to 8600 cubic feet per second, and will hold 63,000 acre feet of water. An acre foot of water is the amount necessary to cover one acre one foot deep. At the maximum stage of such a flood the water will back up behind the dam diagonally northwest, nearly across Shelby county, and will cover 3,600 acres of land. In seven days after reaching its maximum stage, the basin will be empty.

The dam is a massive earth embankment with concrete outlet and spillway structure. It contains one million cubic yards of earth, is 6,600 feet long, 25 feet wide at the top, 460 feet thick at the base, and 78 feet high from the floor of the conduit to the top of the dam. Of the total length of one and one-quarter miles, 3,500 feet is in a low dyke at the west end. (See Fig. 333.)

The decision to construct the dam on its present location was reached only after careful study of a number of alternate sites, notably one above the present location, and another in the Miami just below the mouth of Loramie Creek. The site selected gives the most protection for the least money.

A railroad siding to allow the unloading of the equipment and supplies from the freight cars directly onto the site of the work, was the first thing needed. Therefore, the first shovelful of earth was thrown on March 1, 1918, on the grading work for a siding leading from the Western Ohio Electric Railroad down over the hill, to the site of the gravel plant and repair shop at the entrance to the outlet structure. Clearing the damsite was also started within a few days, the timber being cut into ties for the railroad siding. A transmission line, supplying the power by which most of the machinery was run, was built from Piqua to the damsite. A dragline, narrow-gauge locomotive and cars, and other equipment were shipped in, erected, and as early a start as possible made in excavating for the outlet structure. Houses with sewerage, water, and electricity, for the married employees, bunk-houses for the bachelors, a mess hall, store, and office, were built as promptly as possible, so that by July 15th the employees were housed and the work was well under way. A gravel and concrete plant, gasoline locomotive, two big derricks, another dragline, rock drills, and the many small pieces of equipment necessary for such a job, were assembled and put into running

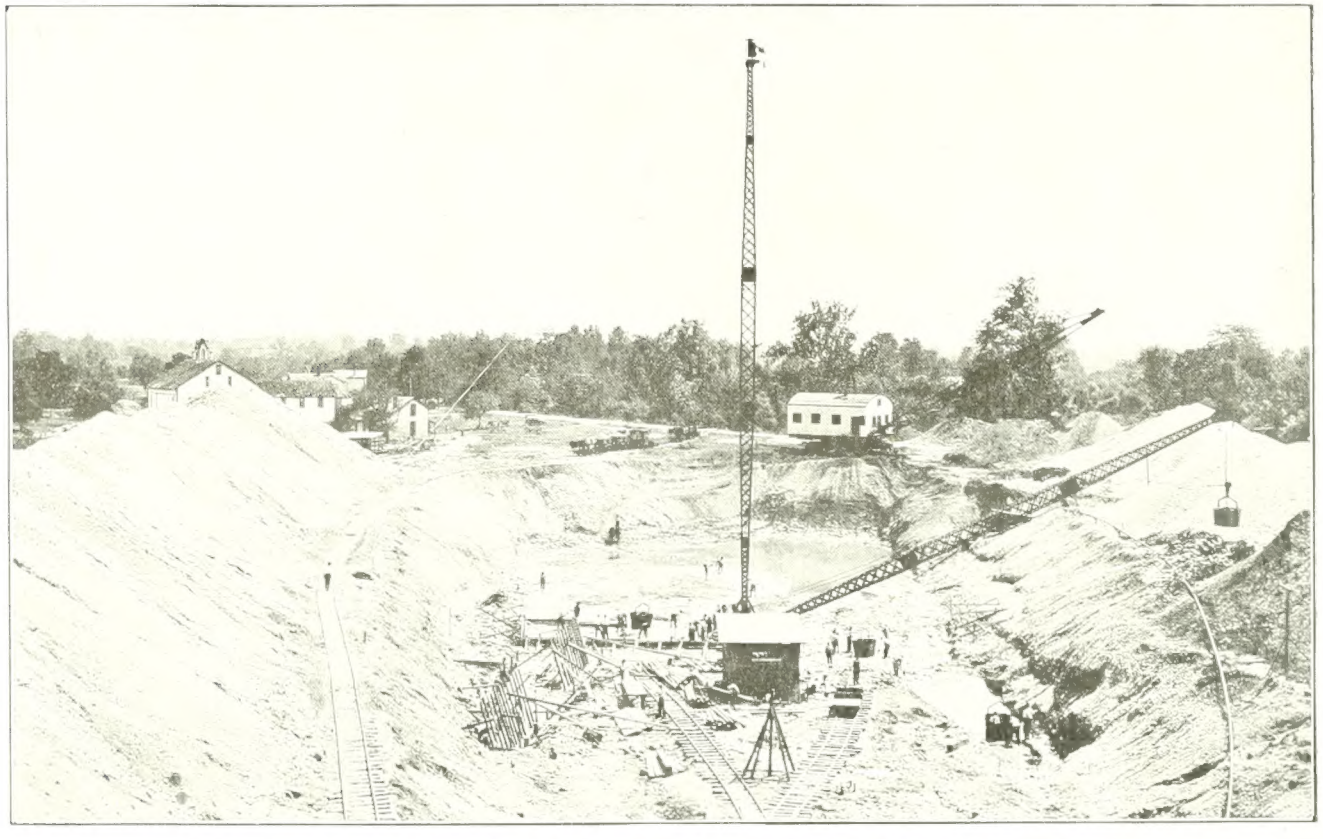


FIG. 332.—LOCKINGTON OUTLET STRUCTURE AUGUST 12, 1918.

The overburden has been removed by the dragline in the background. The derrick is removing loose rock preparatory to placing concrete. The first forms are being placed in position.

order. A contract for stripping and cleaning the damsite and preparing it for the fill, was let, the work was started promptly, and completed by midsummer.

Before the earth dam could be started, Loramie Creek had to be shifted from its natural channel into an artificial one that would keep the waters away from the growing embankment, particularly during floods. The best way to do this was to construct the outlet works in part, and divert the creek waters through the partially completed structure.

The conditions for building the outlet structure were good. Bed rock on which to place the concrete, occurs to the east of Loramie Creek, only a few feet below the elevation of the creek bed. The first job, therefore, was to strip off the gravel and earth that lay on top of the rock, clean off loose rock, and prepare the foundation. The stripping operations were performed with a Lidgerwood Class K dragline; the rock was shaken up by blasting, loaded into buckets, and hoisted out with a derrick (see Fig. 332). The gravel taken out of the excavation proved to be of good quality, suitable for concrete, and was piled to one side for use later, as can be seen in both Fig. 332 and Fig. 334. Such good progress was made that the first concrete was poured on August 10, 1918. Englewood was engaged in the same operation, and progressed at about the same speed. The two jobs had a spirited race to place the first batch of concrete, reached the tape neck and neck, and both claimed a victory.

The Lockington outlet structure is of the retaining-wall type, and is entirely of concrete. It forms a gigantic trough through the dam, from toe to toe and from top to bottom, its edges being coincident with the outlines of the dam. Its sides are formed by two massive retaining walls, passing entirely through the embankment at right angles to its center line, parallel to each other in the middle, and diverging at both ends to facilitate the entrance and exit of water. Its floor is of heavy concrete, laid on the bed rock. At the downstream end is the "hydraulic jump pool," a device to reduce the velocity of water. When the basin above is full, the waters will rush through the conduits at forty miles an hour. Such a stream at such a speed would prove disastrous to the channel below, and the energy must be used up before leaving the dam. The hydraulic jump, with its "stairsteps," "jump," and "pool," uses up energy when the water lifts itself up in the standing wave, and dissipates its fury in fighting with itself in the turmoil below, leaving the lower end quietly at a harmless speed. (Fig. 336.)

Another large flood is an ever-present possibility. As such a flood would be disastrous during the construction period unless provided for, the outlet structure was left as described above, a wide, concrete-lined water way, capable of carrying a flood nearly as large as that of 1913, until late in the season of 1921, when the dam was nearly done. Then, in the middle, along the center line of the dam, was placed a thick wall or weir, pierced at the bottom by two arched openings, nine feet wide by nine feet two inches high, and placed side by side, to carry the waters of Loramie Creek. This weir reaches to within sixteen feet of the top of the dam. The opening, seventy-seven feet long and sixteen feet deep,

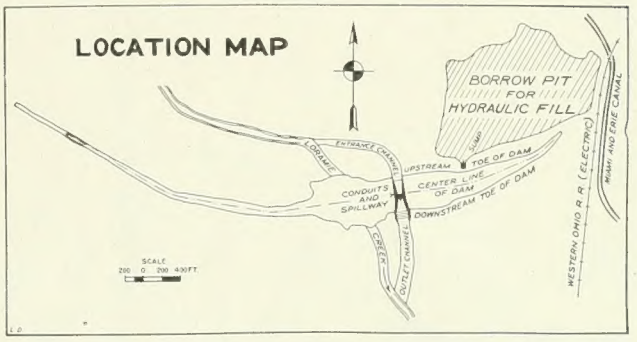


FIG. 333.—GENERAL PLAN.

formed by the top of the weir and the side walls of the structure, is the spillway built as an added factor of safety. It would take a flood more than 40 per cent greater than 1913 to cause water to run over the spillway.

The entire outlet structure is 82 feet in height, 140 feet in maximum width, and 525 feet long. It contains 32,000 cubic yards of concrete.

The gravel for the concrete was washed and screened, and the concrete mixed, in a Dull plant situated near the upstream end of the conduits. The concrete was transported from the mixer in bottom-dump buckets, by a train of narrow-gauge flat cars, drawn by a gasoline locomotive. Two guy derricks, 120 feet high, with booms 105 feet long, handled the concrete buckets from the cars to the forms, and shifted the movable forms. The walls were built in sections, as is seen in Fig. 334. Some grouting under pressure was necessary to seal seams in the rock underneath the concrete.

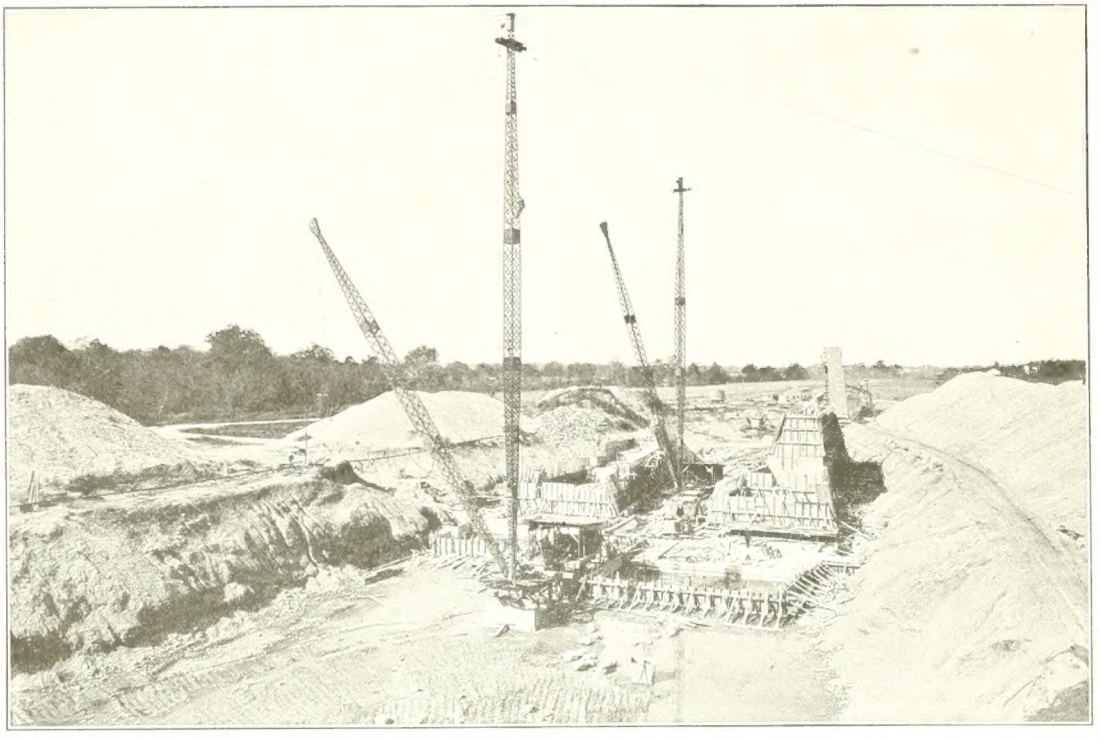
Detailed articles on the concrete construction were published in the Bulletin of November, 1918, and August, 1919. The hydraulic jump was described in the May, 1920, and March, 1921, numbers.

The dragline excavated a channel from the old location of the creek to the entrance of the outlet structure, and cut a straight channel downstream from the structure, until the line of the channel intersected the old stream bed. The bridge crossing the Loramie Creek below the dam, was moved to the new channel, and the road altered to fit. The sides of the new channel were riprapped with random stone.

On May 27, 1919, the concrete work in the walls, floor, and hydraulic jump was completed, and on June 11th, Loramie Creek was diverted into its new channel. Pumping of the hydraulic fill material was started June 12, 1919.

The borrow pit area is located on the east side of Loramie Creek, above the stream level, and just above the damsite. See Fig. 335. Situated on a sloping hillside, it afforded opportunity for sluicing the material down to the dredge pumps by gravity instead of transporting it by train, as at Englewood, Huffman, and Germantown. The equipment installation was, therefore, comparatively simple.

The Miami and Erie Canal conveniently runs a few hundred feet east of the east end of the dam. The use of water from this canal saved many thousand dollars in pumping expense. About twenty cubic feet per second were required for the hydraulic operations. This was more water than the canal could carry in its dilapidated condition, so repairs



This picture was taken from the roof of the dragline and is looking upstream. The two derricks in the middle of the picture handled the forms, and hoisted the concrete buckets to the forms. The sand and gravel was washed and screened and the concrete mixed in the washing plant seen in the background. The concrete was run from the mixer into bottom dump buckets set on narrow gauge cars and hauled by a gasoline locomotive to a point where the buckets could be reached by the derricks. The hydraulic jump was built in the pit shown in the foreground.

FIG. 334.—THE LOCKINGTON OUTLET STRUCTURE AUGUST 14, 1918.

were made on the Port Jefferson diversion dam and the Sidney feeder, so that a larger volume of water could be carried. A further complication was caused by the fears of the citizens of Piqua that their water supply would be interfered with. This was met by the installation of an emergency pump at the Piqua water station. A small forebay was built just below the Miami and Erie Canal, at a considerably higher elevation than the borrow pit. Two eight-inch and one fourteen-inch electrically driven centrifugal pumps were placed at the west end of the forebay. Pumping into a fifteen-inch spiral riveted pipe, these pumps supplied the hydraulic giants used to tear down the hillside. By various combinations of the pumps in series and parallel, a nozzle pressure of from 40 to 175 pounds was obtained, using from a 2½ to 5-inch nozzle. The pressure and nozzle best fitted to work the material being excavated at the moment was used. About ten second-feet were used by the giants. The remainder of the twenty second-feet taken from the canal was carried from the forebay around the top of the borrow pit in a ditch. Water was drawn from this ditch as needed to supply extra water for the sluice ditches.

The dredge pumps were situated at the toe of the dam, east of the creek and the outlet structure and at the lower end of the borrow pit area. Two dredge pumps, directly connected to Allis-Chalmers motors and capable of pumping against 115 feet head, were used to lift the material and water from the sump to the dam. Both fourteen-inch United Iron Works and fifteen-inch American Manganese pumps were used at different times. Twelve-inch special pipe, made by the American Rolling Mills, one line for each pump, carried the two streams of material. The pumps were set in a house with the usual switchboard and grids. Grids were necessary because of the variable load on the pumps. The sump was a timber-lined pit. The sluice ditches ran directly into it. Rocks too big to go through the pumps were kept out of the sump by an iron grating. The borrow pits yielded a considerable volume of "oversize" rocks, and these were hauled out and utilized in paving the slopes of the dam so as to avoid the rather difficult job of inducing vegetation to grow on gravel slopes. The pumps were placed as high as possible, so as to avoid getting the motors wet in time of flood, and the sump as low as possible, so as to get as much material as possible from the borrow pits. This made the lift from the sump to the pump, from twelve to fifteen feet, which is high. Air leakages were avoided by careful packing and caulking.

The hole in which the pump-house was placed was excavated by a derrick, rigged as a dragline. After pumping was started, the derrick remained in place and was used to hoist oversize rock from the grizzlies, and to handle replacement parts for the pumps. It was also available to hoist the motors clear of flood waters, but was not called upon for this service.

The giants started to tear down the hillside immediately in front of the dredge pumps. At first, the material could be pushed into the sump by the giants directly. As the material close at hand was exhausted, the material was excavated and broken up by the giants, pushed into "sluice" ditches on slopes from 2½ feet to the 100 feet, to 5 feet to the 100 feet, and transported by the stream of water rushing down the ditch, to the sump. The stream of water in the sluices was fed by the water from the hydraulic giants, and by the ditch around the top of the borrow pit. As the work progressed, the "face" of the borrow pit was pushed farther uphill, and it became increasingly difficult to transport the material through the long ditches. There was a considerable quantity of ground water flowing into the

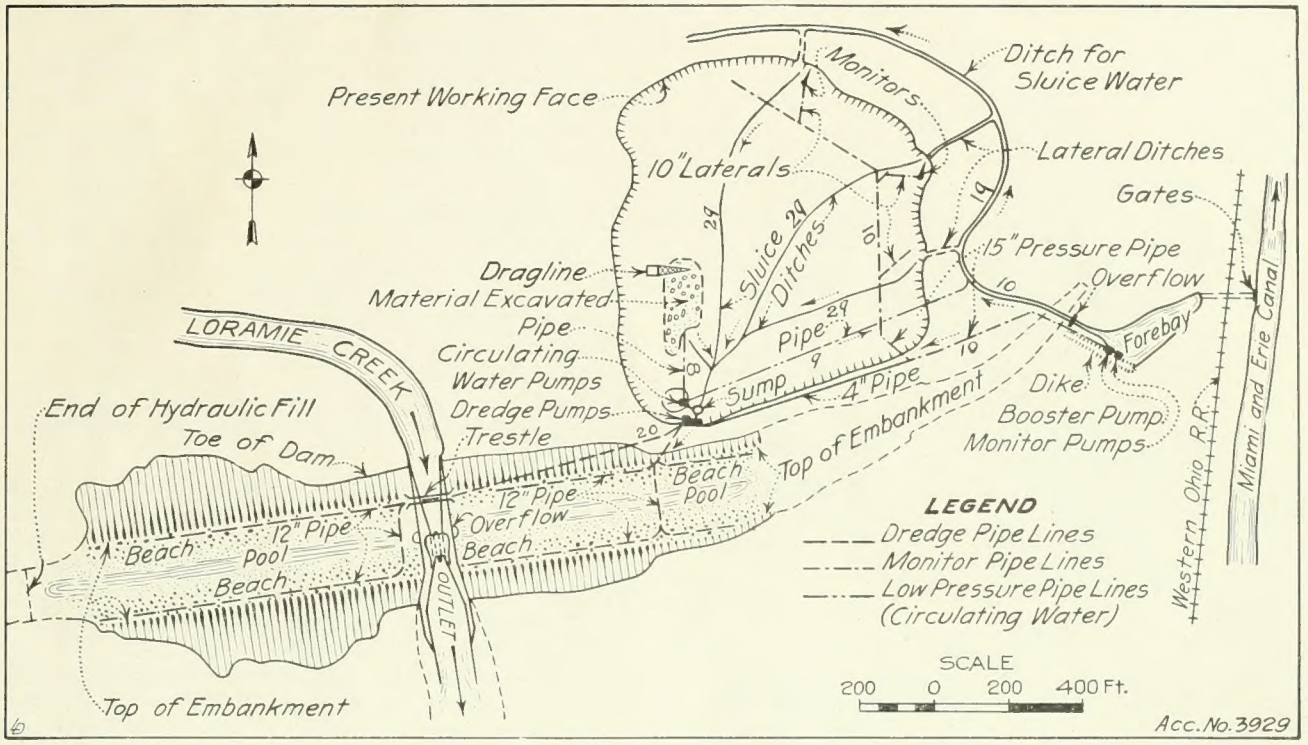
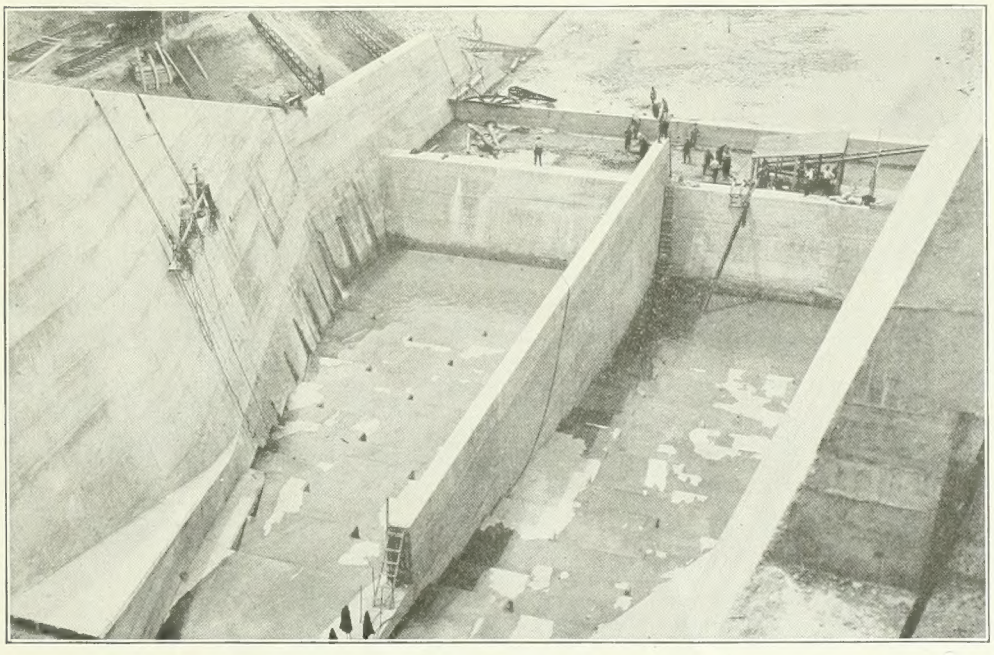


FIG. 335.—BORROW PIT AND PUMPING LAYOUT AT LOCKINGTON DAM IN AUGUST, 1920.

sump which was taken care of by installing a low-head pump which elevated it from the sump to the ditch carrying the sluice water from the forebay to the pit. In this manner this water helped carry material down the sluice ditches from the monitors to the dredge pumps. It did not pass through the dredge pumps but was kept circulating from the sump to the supply ditch. Later, the amount of circulating water was increased by admitting more water from the forebay. While it is true that, in general, the steeper the slope of the sluice ditch the more easily is material transported by it, yet in this case the grades of the ditches had to be kept below five per cent, as the borrow pit would "run out" if steeper slopes were used. Careful study was given this, with the result that material was successfully moved on grades as low as 2½ per cent. This particular phase of the work was considered in detail in the September, 1920, issue of the Bulletin. A small amount of particularly suitable material, situated too low to be handled in the usual way, was thrown uphill into the path of a sluice ditch, by the dragline. The material in the borrow pits varied in character and hardness to such an extent that con-



This picture was taken from the top of the wall the day water was turned through the outlet structure. The water coming from the conduits descends the stairway into the hydraulic jump pool which is divided into halves by the partition wall. The water then goes on over the first wall, into the stilling pool, then on over the second wall into the outlet channel. The standing wave occurs in front of the first wall. The proportions of the structure were determined after extensive experiments with models. The floods in the spring of 1920 and 1921 gave this structure a good tryout. Pictures of the jump in action at Lockington were shown in the May, 1920, number of the Bulletin. A full description of the hydraulic jump was contained in the April, 1921, number.

FIG. 336.—THE HYDRAULIC JUMP AT LOCKINGTON JUNE 11, 1919.

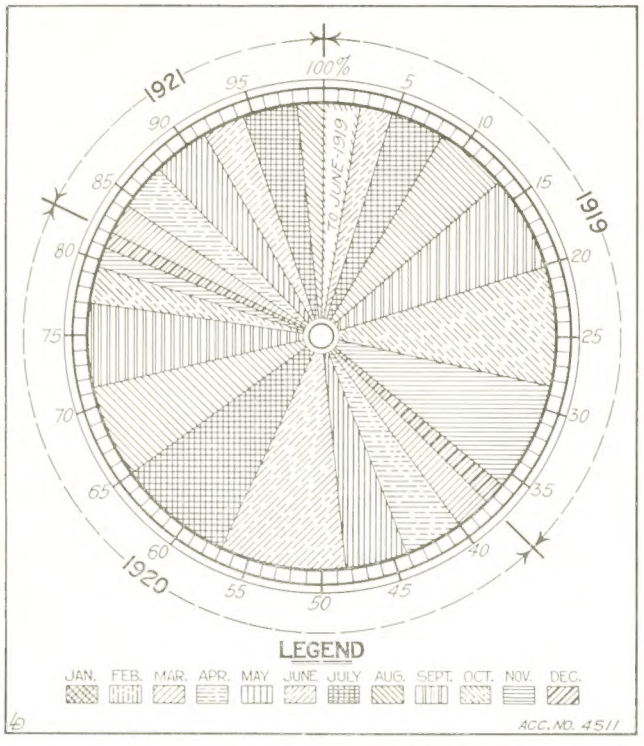


FIG. 337.—LOCKINGTON PROGRESS DIAGRAM.
The placing of the earth embankment is shown in terms of the per cent of the total yardage placed each month.

stant study was necessary to meet the ever-changing conditions.

The first dirt was put through the dredge pumps on June 12, 1919. The first season 195,000 cubic yards were placed, all on the west side of the outlet structure. Two pipe lines were used to carry the material, one on each toe of the dam. The standard methods of hydraulic work were used. The technique of this class of work has been covered by many articles in the Bulletin, notably the February, 1920, number.

The dyke which forms the west 3,500 feet of the dam was placed by the dragline during the season of 1919. The fill east of the outlet structure was not started until after the spring flood season in 1920, so that a possible extraordinary flood, too large for the outlet trough to take care of, could find a safe passageway for its surplus water. On April 5th, the aqueduct on the Miami and Erie Canal feeder at Plum Creek was washed out, thus interrupting the sluicing operations for eight days, while repairs were being made. On April 20th a minor flood occurred without damage to the work. It demonstrated that the hydraulic jump was a success. After the danger season was passed, work on the east side was pressed until it caught up with the west side, and then both sides were carried up to an elevation high enough to be safe against a 1913 flood, should one as great occur.

While, in general, the surplus water from the central pool was drawn off through "chimneys" in the walls of the outlet structure, a syphon was rigged up which drew a part of the water from the pool and discharged it at the upstream toe of the dam. Enough fine material remained in suspension in the water taken off by this syphon, to form an extensive impervious blanket along the upstream toe of the dam, especially in the old creek bed.

The major part of the road relocations made necessary by the retarding basins was completed during this season.

Another minor flood passed without harm, on March 28, 1921. On the night of April 16, during a heavy storm, the dredge pump house partly burned. Despite the extent of the damage, but one week was lost. A washout near the west end of the hydraulic fill on the upstream toe, took out some of the gravel slope but did little damage to the dam. It was caused by the central pool overflowing and running down the slope. A vexatious delay resulted while repairs were made. But despite the annoying delays which slowed up the completion of the job somewhat, the dam was finished on August 20th, and the road across the top put in shape for traffic.

In June, work on the spillway weir was begun, and finished on July 31st. The construction of the bridge followed at once, and was completed September 2nd. Details of this phase of the work are described on Page 15. Dismantling of the equipment and clearing up the job, proceeded so rapidly that when the Conservancy Court visited the work on September 28, this work was nearly finished. A guard rail along the highway across the top of the dam, remains to be placed. A contract has been let for its construction. Except for the care of the vegetation and seeds planted on the slopes, the construction job is a thing of the past.

The Lockington Dam cost complete, with engineering, superintendence, depreciation, clerical, labor, materials, supplies, and everything expended on construction included, $1,280,000. The hydraulic fill cost 75 cents per cubic yard, the dragline fill at the west end of the dam 23 cents per cubic yard, the excavation for the outlet works and channel 69 cents per cubic yard, and the concrete work an average of $9.84 per cubic yard. Labor rates during the period of construction varied considerably from time to time, rising during the war period and falling sharply during 1921. During the period in which

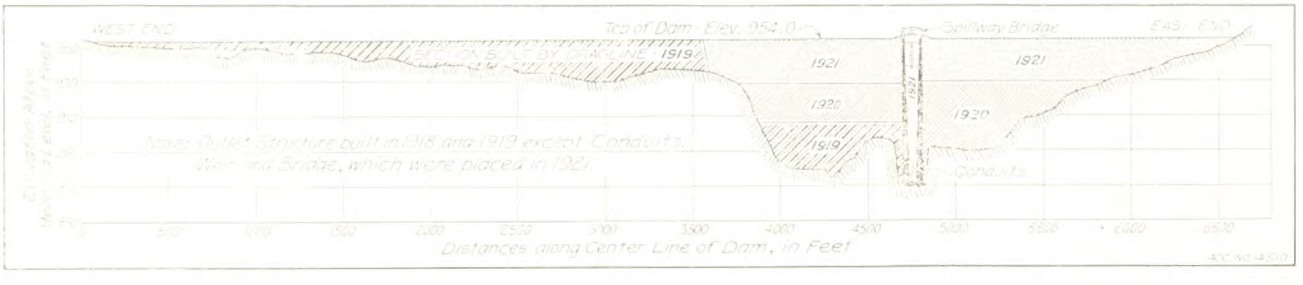


FIG. 338.—PROFILE OF LOCKINGTON DAM SHOWING PROGRESS BY YEARS.

the most of the work was done, common labor received from 38 cents to 46 cents per hour, and good carpenters, 65 cents to 80 cents per hour, with ratio to other classifications in proportion. Materials varied widely. The major part of the cement was purchased f. o. b. Lockington for $3.06 per bbl. with 25-cent sacks, $2.92 with 15-cent sacks, and recently $2.91 with 10-cent sacks. Coal was purchased for $4.19 to $4.65 per ton, run of mine, f. o. b. Lockington. Much of the material used was special, and the prices paid are not comparable with prices paid on other work.

Progress on the Work from July 1 to November 1

ENGLEWOOD

Since the date of the last report, June 30th, the hydraulic fill has maintained its scheduled rate of progress. During the month ending July 25th, the pumping amounted to 157,640 cubic yards for the month ending August 25th, the output was 163,520 cubic yards, and for the month ending September 25th the progress was 142,960 cubic yards, at which time a total of 3,350,900 cubic yards, or 93 per cent of the completed structure, was in place. From now on, however, the rate of pumping may be expected to decrease somewhat, due to the increased lift and the greater length of discharge pipe.

The supply of satisfactory material for building the dam is about exhausted in the portion of the borrow pit south of the National road, and one dragline is now operating north of the road.

The average elevation of the top of the dam at present is about 878, or 100 feet above the river bed and 14.5 feet below the finished crest.

The westerly barrel of the discharge conduit now has its permanent concrete floor and is carrying the river flow. The easterly barrel is unwatered and the concrete bulkheads are being placed. As in the westerly barrel, sand and gravel will be pumped to fill the lower portion and provide a foundation for the permanent concrete floor. For handling this material a discharge pipe is run to the conduit from sump No. 3 and the material placed in the same manner as it is being pumped into the dam.

The spillway concrete is finished with the exception of one block under the derrick. A small amount of grading remains to be done to complete this structure.

The construction of the spillway bridge has advanced 70 per cent. The abutments, walls, and piers are built and the concreting of the girders and the floor slabs is in progress.

The grading and graveling of road No. 7, across the valley five miles north of the dam, is practically completed. A short stretch cannot be completed until the bridge abutments at the Prairie ford and Brush creek bridges are finished.

The Prairie ford bridge for road No. 7 over the Stillwater river is being constructed. Piles have been driven for the center pier and concreting is in progress. Excavation for the easterly abutment has been carried to rock and is ready for concrete. The piers and abutments for the bridge at Brush creek are about 50 per cent completed.

The grading and graveling of road No. 6 is completed.

H. S. R. McCurdy, Division Engineer.

October 25, 1921.

LOCKINGTON

On August 20th the hydraulic fill was completed. The dragline then backfilled the gravel pit just north of the dam, and moved to the east end where it placed 750 cubic yards of fill in the gap at the extreme end of the dam through which the pipe lines supplying the monitors were laid.

On July 31st the last concrete was placed in the spillway weir. The construction of the spillway bridge followed without interruption, and this structure was completed on September 2d.

Dismantling of the plant is practically completed and the camp has been sold and is being torn down by the purchasers of the houses.

Lyons and Cole, contractors of Blanchester, Ohio, have been awarded the contract for the construction of guard rail on top of the dam, and this work is now under way. With the exception of the guard rail the entire Lockington job is now completed.

J. J. Loehr, Assistant Engineer.

November 1, 1921.

TAYLORSVILLE

Twenty-three hundred feet of the west end of the dam has been finished to final grade. The remainder, or river section of the dam, is up to an average elevation of 828 feet above sea level, or 9 feet below the top of the dam. By the middle of November the entire hydraulic fill should be completed.

The concrete spillway was finished in September and the concrete bridge over the spillway was poured the last of October, excepting the guard rails. These will be poured the first week in November. By the tenth of November, 180 cubic yards of slope paving on the upstream slope of the dam adjacent to the outlet walls will be finished. This last will complete all of the concrete work at Taylorsville. Charles Crampton has the building of the approach from the east end of the bridge over the Baltimore & Ohio down to the top of the dam under contract, and also the finishing of the approach of road No. 15 to the top of the dam. He has now done about two-thirds of these jobs and should finish in another week.

Road No. 15, across the valley at Dugans bridge, has been raised to the elevation of the bridge floor.

The outlet channel has been completed and the Lidgerwood dragline is being moved over to the railroad to be dismantled.

Roberts Bros. finished their contract on the rock slopes at Taylorsville in September.

O. N. Floyd, Division Engineer.

November 1, 1921.

HUFFMAN

During the months of July, August, September, and October, the placing of material by the hydraulic process in the main embankment of the dam has continued over the entire length of the structure. On October 28th the embankment was completed to within 8 feet of the top. But 35,000 cubic yards of fill remain to be placed in the section of the dam north of the outlet. Work is progressing in the short section of the dam south of the outlet. The material in this section is being placed in thin layers by teams and compacted by rolling. On October 28th, 9,000 cubic yards remained to be placed in this section.

Concreting on the conduit piers and spillway started on July 24th and was completed on October 21st.

All rocks too large to pass through the dredge pumps have been screened out of the material before it reaches the pumps, and have been placed as paving on the upstream face of the dam.

Work was started on September 27th on the gap in the relocation of the Valley pike at the north end of the dam. This work was completed on October 25th.

C. C. Chambers, Division Engineer.

October 28, 1921.

DAYTON

Dragline D-16-8 has completed all levee embankment between the Big Four railroad and the new South Broadway highway bridge. It has also constructed the highway embankment between the Broadway bridge and the Springboro pike. The machine is now engaged in excavating the cut-off channel west of Broadway. D-16-15 is continuing channel excavation and levee construction on the right bank of the river below Stewart street. D-16-16 is making good progress between the D. & U. railroad and Washington street bridges, and the east levee is now complete. This machine has been working in conjunction with train haul to spoil banks near Stewart street since September 20th and is now about to build the west levee. D-16-19 has completed all work on the south side of Wolf creek and is now working on the north bank between Broadway and Sunrise avenue.

Since the report of June 30th, several small concrete retaining walls have been constructed. The large wall

work in Dayton is complete except for a small portion of the DeKalb street wall and the placing of some coping. Work is now under way on various sewer headwalls and extensions of existing pipes. This class of work is about 90 per cent complete.

J. C. McCann has completed all embankment on Mad river west of Findlay street. He is now working, under contract, on the levee embankment and enlargement of the old Erie railroad embankment between Findlay street and the bridge over Mad river.

Price Brothers Co. is placing revetment along the north bank of Wolf creek upstream from Williams street.

Up to the end of September, 99,800 cubic yards of sand and gravel had been issued from the Sunrise avenue gravel plant.

Contract has been let for the establishing of one gravel screening plant on Wolf creek and two plants on Mad river to check the movement of material into the improved channels. The Wolf creek plant is now under construction and will be ready for operation about November 1st. It is situated on the south bank just west of the Pennsylvania railroad bridge.

Channel excavation to October 1 amounted to 1,151,500 cubic yards. Levee embankment amounted to 345,600 cubic yards. The total yardage handled in accomplishing these quantities was 2,825,000 cubic yards.

October 18, 1921. C. A. Bock, Division Engineer.

HAMILTON

The total amount of channel excavation, item 9, to date is 1,250,000 cubic yards. The filling of the south spoil bank has been completed and the trackage and hauling equipment is being moved to the north spoil bank. While this moving is in progress, the electric dragline, D-16-18, is excavating the last cut on the west side of the river at the south end of the improvement, wasting the material thus excavated. After completing this cut it will cross the river and move to the north side of the Main street bridge and begin work on the east side of the channel.

The class 14 Bucyrus dragline has completed the levee between the Main street bridge and the Champion Coated Paper Mill. It is now grading a track bed along the east bank, leading to the north spoil bank.

The small Marion dragline has been used for grading, track-shifting, and excavating for the South avenue sanitary sewer outlet. It is now grading for the dump tracks on the north spoil bank.

Concrete walls have been completed at the south end of the Champion Coated Paper Mill and along the Bottinger lot at the west end of the Main street bridge. The South avenue sanitary sewer outlet has been completed. This is a 3-foot-diameter, submerged concrete sewer, 150 feet in length.

Fourteen flood-gate man-holes on city sewers, have been completed.

All arches and spandrel walls on the Black street bridge have been completed. The falsework and forms have been removed. The concrete railing will be completed in about ten days. This will complete all of the concrete with the exception of that part of the sidewalk which is to be laid on the backfill. Work is just being started on the waterproofing of the arches and spandrel walls.

Price Bros. have completed the slope and flexible slab revetment between the Columbia bridge and the Champion Coated Paper Co. wall, a stretch of about one mile. This completes their work here for the season. The manufacture of concrete blocks has been completed and the block plant dismantled. The total number of blocks cast was 225,377.

October 25, 1921. C. H. Elfert, Division Engineer.

PIQUA

Since last July the levee work has progressed steadily. The scarcity of suitable material for levee work forced a double throw of the material from station 33 to station 51. The big dragline has made its first throw of this, and is making its second throw on its return trip, being now at station 46. Thirty-three thousand yards of material were handled by this machine last month.

The placing of top soil on the levee and the planting of grass seed has reached station 32. A good stand of grass is being secured on the levee.

November 1, 1921. Albert Schroeder, Assistant Engineer.

UPPER RIVER WORK

Troy. Since July 1st, the dragline D-16-21, under the direction of Donald Jeffrey, has completed the channel and levee work above Adams street bridge and also placed 22,000 cubic yards of embankment in the levee between Adams street and Market street on the right bank of the river. This levee is now ready for top soil, revetment, and parapet wall.

T. Daniels & Son have practically completed their channel excavation, except the north approach to Adams street bridge. This work will be started as soon as Market street is opened to traffic.

Price Brothers completed their work around Market street and S. T. & P. bridges about September 1st, and then started work on the underpinning of the three existing piers of the Adams street bridge. This work has progressed favorably, and concreting will soon be started.

The Finke Engineering Co. returned to Troy July 12th, and after completing their levee embankment, the raising of the Dixie Highway and the D. & T. traction line was undertaken and completed by the middle of September. Since then, the contract for the paving of the approaches to Market street bridge was let to the same company and this work has also been completed.

The contract for the new steel span for Market street bridge was let to the Central States Bridge Co. They started work on July 12th, and completed the bridge floor on September 24th. The repairs on the two old spans were completed on October 1st.

The District work on the Adams street bridge, under the direction of Mr. Rogers, began with his arrival on September 10th. To date a good share of the necessary plant has been accumulated and erected. The carpenter and blacksmith shop is working and the mast for the derrick has been raised into place. As soon as Market street is opened to traffic, Adams street will be closed. Daniels will excavate for the new north abutment, and Rogers will start concreting.

Tippecanoe City. The dragline D-16-4 completed the levee north of Main street on July 1st. The greater share of the time since then has been spent in casting about 45,000 cubic yards of material into place for final throw into levee. About 600 lineal feet of levee has been built below Main street. Double shift on levee work started on October 10th.

The work on the canal intercepter will probably be completed by the 1st of December. The excavation work in the canal has been done by a small dragline. Less than 1,000 lineal feet of 36-inch concrete sewer remains to be done.

The Fourth street sewer was let to J. C. Mercer & Sons of Piqua, Ohio. Construction work was started on September 19th. A Keystone excavator is being used for the trench excavation. To October 10th, about 80 feet of trench has been opened up and 60 lineal feet of 66-inch concrete sewer poured. A new and heavier Keystone excavator has just been added to their equipment and better progress is expected.

The contract for the Bull Run ditch with culverts at Second and Third streets, has been let to Wm. Oberer of Dayton. He started work October 10th with six teams. This work includes approximately 10,000 cubic yards of excavation and 500 cubic yards of concrete in culverts.

A. F. Griffin, Assistant Engineer.

October 20, 1921.

LOWER RIVER WORK

Miamisburg. The east levee is now complete with the exception of a short gap from the tail race of the Miamisburg Paper Co. to that of the Ohio Paper Co. The total yardage in this levee, including the gap, is about 158,000.

On the 1st of August, Wm. Oberer completed the levee along the east and west banks of the canal from the locks at Lock street southward to a point opposite the main east levee. This contract amounted to 9,700 cubic yards. In September Oberer completed the lower Germantown road elevation, amounting to 1,725 cubic yards, filled a gap in the levee below Linden avenue amounting to 1,200 yards, and placed 1,800 yards of top soil on the levee above Linden avenue.

A 4x5-foot reinforced concrete culvert in which a sluice gate will be placed was built on the lower Germantown road by the District's forces. There are 63 cubic yards of concrete in this structure.

Price Bros. have completed the flood gate structure in the M. & E. canal north of Sycamore creek, and within a few days will have completed the structure in the tail race of the Miamisburg Paper Co. Total concrete in these two structures is 337 cubic yards.

Franklin. The dragline is rapidly completing the last cut of the channel excavation. The total quantity excavated to date is 76,000 yards. Of this amount 54,000 yards was loaded into 4-yard dump cars and placed in the levee, 12,000 yards was hauled to the spoil bank, and the balance was deposited in the levee by the dragline. The levee above the suspension bridge will be completed in two weeks.

Concreting on the Miami avenue wall was begun July 29th and on September 26th 1,937 cubic yards had been poured. The upper section of the wall, 5 feet 3 inches in height, will not be poured until the fill back of the wall is made. This fill amounts to about 5,000 yards and is being handled by a 70-foot boom stiff-leg derrick and a one-yard clam-shell bucket. This is the rig that made the excavation for the wall and handled the concrete buckets and forms. The concrete apron for the protection of the existing wall along Miami avenue has been completed. This apron is 700 feet long, 8½ feet wide, and contains 200 cubic yards of concrete and 700 lineal feet of 8-foot to 12-foot steel sheet piling.

The Front street crest wall is now being constructed and will be completed in two or three days. This contains 80 cubic yards of concrete.

Middletown. Levee maintenance work, consisting of cutting weeds, seeding bare spots, etc., has been completed for this season. Geo. Shartle has completed the levee along the Big Four spur back of the traction station.

October 20, 1921. F. G. Blackwell, Assistant Engineer.

RAILROAD RELOCATION

Big Four and Erie. Completed.

Baltimore & Ohio. Completed.

Ohio Electric. Since July, 1921, the track-laying and ballasting of the section of the relocation lying between Fairfield and Carlisle Junction has been completed by Roberts Brothers, the contractors who had the work. Shifting 1,000 feet of line near Huffman dam, has also been completed, and the Springfield pike which parallels the Ohio Electric at this point, has also been shifted to its final location. The bridge over Mad river has been completed by the Brookville Bridge Company. Traffic over the new line between Fairfield and Carlisle Junction was turned on October 27th, and except for dismantling the old line above Fairfield all the Ohio Electric work is completed.

November 1, 1921. Albert Larsen, Division Engineer.

RIVER AND WEATHER CONDITIONS

July to October, 1921

River and weather conditions during the months of July to October, inclusive, were not marked by any very unusual occurrences. Fluctuations in meteorological factors were not abnormal; and there were no storms of sufficient intensity to cause appreciable rises in the streams. Rivers were comparatively low except during the first week of August when there was a slight rise due to the two-week rainfall of August 1 to 3.

The mean values of the different factors during the months of July to October, taken from the U. S. Weather Bureau summaries for the Dayton station, are given in the following tabulation:

Factors	July	Aug.	Sept.	Oct.
Rainfall, 1921, inches	1.34	3.30	4.76	1.79
Rainfall, normal, inches	3.28	3.01	2.50	2.40
Excess or deficiency, inches	–1.94	0.29	2.26	–0.61
Temperature, 1921, degrees	80	72	71	54
Temperature, normal, degrees	76	73	67	54
Excess or deficiency, degrees	4	–1	4	0
Number of clear days	18	16	9	16
Number of partly cloudy days	13	10	17	6
Number of cloudy days	0	5	4	9
Number of days with rainfall of 0.01 inch or more	8	9	14	10
Prevailing wind direction	SW	SW	SW	SW
Average hourly velocity, miles	7.9	7.6	8.1	10.6
Maximum 5-min. velocity, m.p.h.	48	35	54	35

Ivan E. Houk, District Forecaster.

November 1, 1921.

Savings From Little Things

Salvage Operations Successful in a Relatively New Field.

The Miami Conservancy District is doing the major part of its construction work with its own forces. Besides employing an engineering and construction organization, it has purchased all of the equipment, material, and supplies necessary for the prosecution of the work. About one-half of the District's construction expenditure has been for labor, and the other half has been for materials, equipment, and supplies.

The handling of equipment and material on construction work has, in the past, received careful thought from engineers and contractors. Benefiting by the experience of others, the District was able to establish a satisfactory and economical method of handling these things, at the very start of the work. With supplies, however, the general practice on construction work has been to buy, use, throw away, and re-buy. The District, by its salvage operations, pioneered to a considerable extent.

A big job just seems to devour repair parts and supplies. A never-ending stream of orders for shovels, rubber boots, padlocks, valves, pipe fittings, steam hose, cable clips, nuts, washers, dowel pins, repair parts, and several thousand other articles, goes through the Purchasing Division continually. It is not hard to see the reason for this. An easy way to lose large sums of money is to waste time on defective machinery. So it is very natural that some of the smaller things such as valves, hose fittings, lubricators, injectors, etc., should be treated with small ceremony when they "go bad." If a $3.00 valve is caught wasting even a small amount of the precious steam for a $40,000.00 drag-line, no jury is needed to sentence the culprit. Without ceremony the long arm of the ever-watchful Master Mechanic reaches out and, presto! a shiny new one-hundred-per-cent valve is put on guard, and the offender finds itself down and out, back in some out-of-the-way corner along with a number of other incompetents with an avoirdupois value only.

It is not unusual on construction work, generally, and quite often in manufacturing plants, to pay no attention to the incompetents, after they have once failed, except to sell the junk pile every so often to a thrifty junk dealer at so much a pound. Most construction men are strongly opposed to the use of second-hand supplies. They can hardly be blamed for their attitude. So much second-hand stuff is useless. The use of second-hand supplies often results in a penny-wise and pound-foolish situation.

But on a big job like the Conservancy work, the sum of these little items amounts to an astonishingly large total. For instance, about 3000 valves, of two-inch size or less, little fellows all of them, with a total value of about $10,000, have been purchased since the job started; and 580 axes, 23,550 cable clips, 300 sledge hammers, 900 picks, and other supplies in proportion, have been furnished to the job by the central warehouse in small lots.

At first, everything was new—the plant was being assembled and extended, and the supplies used were mainly for this original installation. But soon replacements had to be made, and the junk piles began to grow.

But a small problem bobbed up first, the solution of which paved the way for the exploitation of the junk piles. The work is so big that it has been broken up into divisions, each with a superintendent in charge. [illegible] accustomed to being [illegible] work. But the District is compact enough so that communication is easy between the divisions, and the work is supervised as a unit, with a constant shifting about of equipment, men, and supplies between the divisions. At first the superintendents and engineers were not used to this, as jobs as big as this one are very rare. Instead they had all previously been on work located [illegible] from the source of supplies. Being a canny lot, as soon as they had the work well under way, they began to horde repair parts, pipe fittings, special tools—the many things their jobs might or might not need, but would always need in a big hurry if the emergency came. Nothing hurts a superintendent's feelings worse, or damages his reputation or his costs more, than waiting for repair parts [illegible] such things soon accumulated at each job, ready for use when the time came.

But the amount of money tied up in those reservoirs of supplies became so large that a survey of the situation was made. In some cases special repairs were held in reserve at six or seven of the divisions, when one or two held at headquarters to be rushed out in case of breakdowns, would have been ample. Jobs fortified themselves against a series of acci- [illegible] number of valves and fittings on hand, when one or two valves and a limited supply of fittings would be enough in the field if a reserve stock were available [illegible] supplies back into the central warehouse. It was a campaign of education largely. At first the superintendents, fortified by their experiences of the past, [illegible] made to separate them from their accumulations. But as soon as they were convinced that the central supply depot would actually give satisfactory service in emergency cases, and that the cost of their work would be lowered by turning in their surplus stock, they gladly co-operated with headquarters in the round-up of extra supplies. Organization was found necessary. Periodic visits to the different features were made by a man specializing in this work. Being well posted on the needs of the job as a whole, he often "spotted" an article that could be spared from one division and was badly needed by another. Oftentimes a truck accompanied the collector, and the supplies [illegible] released. By systematically going over the camps, shops, and the jobs themselves, often stuff put away in out-of-the-way places for safe keeping and almost forgotten, was turned up and put to work. After a time every one accepted the innovation as the usual thing, and soon the system was working smoothly and efficiently. While at first the efforts were confined to getting surplus supplies back into the central warehouse, it was not long before a wide variety of articles was being handled, transfers were being arranged between divisions, and swaps of machinery engineered.

While all this was going on, the junk piles continued to grow. Despite the precedent long established on construction work, that it does not pay to waste time on anything after it has reached the junk pile, the same organization that was collecting the surplus supplies and handling the equipment transfers, collected a few standard articles from the discards about the repair shops and brought them into the general shop in Dayton. A good, handy mechanic was selected and put to work repairing the different things brought in. Very careful check was kept on the cost, and the result was so encouraging that the operations were greatly enlarged and a great miscellaneous mass of material was rounded up from the jobs and worked over. Valves were so numerous, and obviously in many cases needed so little attention to make them serviceable again, that they were

FIG. 339.—JUNK.

among the first of the products of the salvage division. Then the operations were extended to cover [illegible] rubber boots, wheelbarrows, window sashes, jacks, [illegible] pumps, grindstones, chain tongs, oil pumps, dump cars, oil cans, steam gauges, valves, cable clips, and many other things. Nothing was too large or nothing was too small for the salvage division to tackle. A cable clip is a little thing, commonly not even detached from the wire rope when the cable is thrown away. Yet two men equipped with an automobile and an acetylene torch secured 1693 clips of various sizes from the piles of discarded rope out on the job. The saddles were dipped in paint and new U-bolts were put in, and the rebuilt clips issued to the job at somewhat less than the new price. The net saving to the District on this one transaction was $138.00. Very often it was found that by taking three wrecked wheelbarrows, two usable ones could be produced. Discarded stoves were gathered up. Sometimes it took two or three wrecks to make one good stove. At other times, the addition of a casting or two and the application of a little stove-polish worked wonders.

It was early found that great care was needed to avoid salvaging something that cost more to save than it was worth. Rubber boots are used in large

quantities on the District work, on account of the sluicing operations. They are useless to the job when they begin to leak. At first glance this looked to be a fertile field for the repair man, but a few trials demonstrated that a reclaimed boot strong enough for the severe usage given it on the pipe gang cost more than a new boot. Great possibilities were seen in turning discarded telephone and telegraph poles into fence posts, but the fence posts produced this way persisted in costing more than new ones made in the regular way. Wrecking buildings for the lumber they contained, often proved to be a delusion and a snare. The policy was early established of trying out new operations in a small way before plunging extensively, and nothing was worked upon that did not show a definite advantage or saving to the District.

It was recognized that the junk has a value, as junk, to the division that has it in its possession. Therefore, the practice has been for the salvage division to take in the articles from the field at a price, much as they would buy it if they were outside dealers, do the repair work, and reissue the articles to the job at a figure high enough to cover the price paid to the field plus the cost of repairs. So far, about $60,000 worth of material has been salvaged and reissued. This had, of course, a value as junk. This junk value was about $35,000. The cost of reclaiming this, overhead, supplies, and everything, has been about $3,000, leaving a clear gain of about $22,000 from the transactions. All this has been made on little things. The division has grown from one man working only part time, to four men working full time. The best results have been secured by centralizing the supervision, conducting the work as a part of the headquarters operations. The engineer in charge has become a specialist.

So successful was the salvage work that it has become very convenient in some cases to repair machinery and to handle a portion of the movement of equipment about the job through the salvage division. At the present time, with the District's work rapidly drawing to a close, equipment and supplies are being released for sale. It has fallen to the salvage division to prepare these articles for sale, and to assist in listing and pricing them.

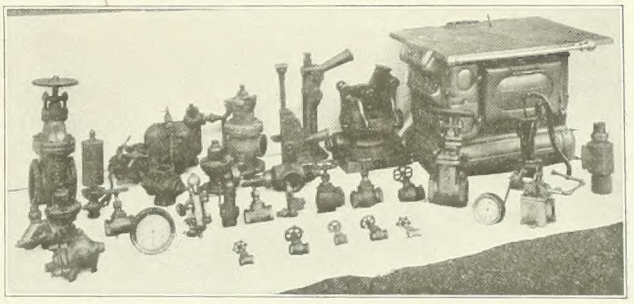


FIG. 340.—NO LONGER JUNK.

At first the veterans of the construction force took the delvings into the junk piles as a joke. However, they were glad to help, and were interested in the experiment. They were glad, also, to receive the substantial credits to the costs of their work that were derived from the rehabilitation of the various down-and-out articles. They were inclined at first to be doubtful of the quality of the reclaimed stuff, but after a few trials they were convinced of their utility. It was early found that a careful cleaning, and the application of a little paint, greatly aided in convincing the construction men that the second-hand articles were "as good as new." As with all innovations, the salvage work had to win its way on its merits. Besides the definite saving in dollars and cents that is in plain sight, the indirect saving secured through the interest aroused throughout the job, in the savings in little things, and through the economies evolving from the services of the salvage division as a "go-between" in the movement of supplies and equipment about the job, has been of great value to the Conservancy District.

From Draglines to Toothpicks

Selling the Equipment and "Left Overs" Promises To Be a Large and Interesting Undertaking

When the last shovelful of earth is thrown, about a year from now, the Miami Conservancy District will go out of the construction business, and will have no further need of its locomotives, cars, draglines, construction camps, mess halls, motors, pipe lines—the multitude of different things needed to carry out a widely diversified construction program. Already the completion of the Germantown and Lockington dams, and of portions of the other work, has released a considerable amount of equipment, material, and supplies for sale. A good part of it has already been disposed of. New releases are being constantly made. Selling promises to be a larger problem than buying has been. The articles up for sale range from draglines to toothpicks, and from mess halls to rivets.

As explained in another article in this Bulletin, a good deal of the miscellaneous material for sale is being salvaged from the job. Some of the rest is second-hand, in such good condition that reclamation work is not necessary to prepare it for sale. Some is new, being in part replacement parts and supplies held in reserve for emergencies that never materialized, and being in part left-overs, odd sizes, and other odds and ends from the commissary stores. By far the greatest part of the money value is in the larger pieces of equipment, such as draglines, locomotives and cars, and in the camp buildings.

Until the Germantown job was finished in January, 1921, the District had practically nothing for sale, except from the railroad relocations, and that is another story. The Conservancy camps were planned to meet not only the unusual conditions incident to the nature and size of the flood prevention project, but also the abnormal difficulty that prevailed at that time in securing and keeping a desirable and efficient body of workers. The houses are attractive, with running water, electric lights, baths, and sewer connections, and are much superior to the ordinary camp dwellings. So when the problem of disposing of some sixty-five odd buildings from the Germantown job, ranging from sheds to two-story houses, came up, no one was prepared to say what the houses were worth. As Germantown

camp had no rail connection with the outside world, it was determined to sell the buildings "as is," to be moved from the premises. Professional wreckers shook their heads.

To ascertain, if possible, the demand for and the value of the buildings, an auction of eight of the properties was held. A live crowd of four or five hundred people gathered on the 26th of January, 1921. Spirited bidding resulted, and values were established at a much higher figure than the professional wreckers had attempted to set. A bride and groom bought one of the first houses put up. The remainder of the buildings were sold at private sale, and brought even higher figures than those of the auction. Lockington camp has been sold during September and October of this year, and even better prices were obtained than were secured for Germantown. In addition two tracts of land with houses on them have been sold to home-seekers, and the waterworks were sold in place—something that was not done at Germantown. Three camps, containing several hundred buildings, remain to be sold next spring.

Comparatively little large equipment has been released as yet, but after Christmas a large amount will be offered for sale. The market for this class of stuff is necessarily limited to firms and individuals doing construction work, and consequently the local market is extremely limited. Prospective buyers are being located through advertisements in the technical press, and through correspondence. A wide field is being covered by means of the publicity. But little trouble has been experienced in disposing of the machinery placed on sale so far, and two draglines, a locomotive, sixteen cars, eight rock drills, four pumps, and some smaller articles, have already been disposed of.

But the greatest interest lies in the sale of the little stuff coming from the salvage operations, from the dismantled camps, from the commissaries and mess halls, from every nook and cranny of the job. No one anticipated its volume nor the returns that are being secured from its sale. One of the first lists of stuff for sale contained over eight hundred different items, and it was followed with a supplement containing four hundred more.

A fundamental principle in selling is to first catch your customer. The market for the little stuff is largely local. Newspaper advertising has been very effective. The newspapers have co-operated by writing news stories on the subject. Sales lists have been mailed to prospective buyers. Personal visits have been made by District representatives to many customers. The demand for certain articles has been very good; for others a good deal of hustling has been necessary before buyers have been found.

In breaking up a camp, it was early found advantageous to sell as much small stuff as possible right on the ground. The surrounding farmers are glad to buy second-hand lumber, even scrap being disposed of at very good prices, and also many of the small tools, hardware, and mess hall equipment and supplies. Scrap and junk not worth salvaging is disposed of to junk dealers near at hand. A clean sweep is made of the remainder of the small articles by bringing them into the central warehouse in Dayton, cleaning them up, and placing them on sale.

In fixing the prices of the various articles, the original prices are looked up and compared with the present-day prices obtained from retail dealers, wholesale merchants, and mail-order catalogues, the depreciation from age or use is taken into consideration, and a fair price thus established by the purchasing division, salvage division, master mechanic—some one who is especially well fitted to judge of the value of the particular article being priced. In the case of equipment and valuable supplies, an appraisal board is named to fix the price. The prices are reviewed and approved by the chief engineer before they are finally set. The selling is done from these fixed prices. Any one with the cash can buy as much as or as little as he wishes. As the war upset values, sometimes second-hand articles bring more today than when they were purchased new at the start of the work.

The force engaged in selling has been recruited from the District employees, and is mainly composed of men who have other duties. Employment work is at a low ebb. The District's employment manager, besides taking care of his employment duties, does the major part of this class of selling. The salvage division, besides doing much of the preparation work, is also doing considerable selling. The warehouse forces, superintendents, and engineers all help. The purchasing division is disposing of the large equipment. Reports of everything sold, listing each item separately with the prices received, are required from the selling force every two weeks. These reports are carefully gone over by the chief engineer before his final approval is placed upon the transactions listed.

A recent report of sales for two weeks made by the employment manager, contained 275 different items, and a short section of it ran as follows:

4 pairs hip boots (used).
160 feet radiators (two column).
1 doz. ox-blood polish.
1 doz. Bee playing cards.
1 Estate Dart stove (second-hand).
1 box shoe laces.
1 stove pipe elbow.
1 dish pan (used).
1 5-lb. pail Rat Doom.
4 lbs. 11/16″x4¾″ C. H. rivets.
1 bottle Barkeeper's Friend.
2 ends of dish tables.
1 pair shoes, style 2.
1 kitchen table (damaged).
1 cash register.
1 house at Lockington.
1 old mop bucket.

The 275 different items covered by that two weeks report brought $5,691.16.

The successful sale of the equipment and "leftovers" belonging to the District, is very necessary. The customers so far have come from all walks of life and business, and have purchased liberally. The wide variety of articles for sale appeals to an equally wide variety of customers. Much has been advantageously sold so far. More is becoming available every day. This winter will see three more camps dismantled, and excellent bargains offered in many different lines. The District will exert every effort to successfully dispose of its plant and supplies at advantageous prices.

The Construction of the Lockington Weir and Spillway Bridge

As explained elsewhere in this Bulletin, the first step in building the Lockington Dam was to erect in 1918 and 1919 enough of the outlet structure to form a wide, deep trough through the dam, thus providing a safe waterway for large floods that might occur during the construction of the earth embankment. Notches were cast in the side walls of the trough to be used later as a means of keying the weir to the remainder of the structure.

A weir is a dam so built that water can flow over its top without injury. Construction of the Lockington weir started in June, 1921, when the spring flood danger was past. It is a massive concrete wall pierced by two openings at its base nine feet wide by nine feet two inches high. It rests on benches on the side walls and on the pier between the two arched conduits. A discussion of the structure as a whole is given on Page 5 of this Bulletin.

The weir is of the sharp-crested type. The upstream face is vertical. The lower face forms an ogee curve. The word "ogee" is a nickname applied to a curve shaped like a thin letter "S" and tilted half-way on its side. When of the right proportions such a curve will allow a sheet of water to flow over it with very little disturbance, and the lower surface of the sheet of water will be in contact with the curved face throughout its entire length. The weir is a gravity dam. That is, it is stable against sliding or overturning without the aid of reinforcing steel. It is about forty-six feet thick at the bottom and fifty-four feet high above the conduits. The crest is about sixty-two feet above the floor of the outlet structure.

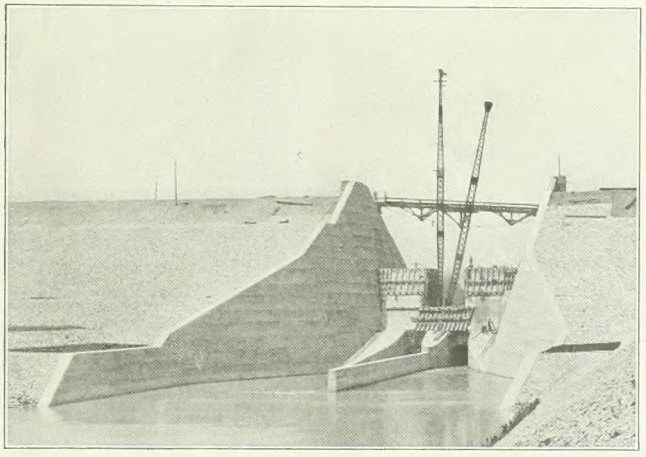


FIG. 341.—LOCKINGTON OUTLET STRUCTURE ON JULY 11, 1921.

The hydraulic fill is nearly done, and the weir is about two-thirds completed. The forms are the sliding type standard with the District.

In constructing the weir, steps were left in the curved face where the bridge pier was later placed. Thus all of the load of the pier and bridge is carried on the horizontal steps and no shearing stress is developed along the face of the weir.

A highway runs across the top of the dam. As the spillway is a notch in the dam sixteen feet deep, a bridge is necessary to carry the roadway over the spillway. After a careful study of the problems involved, a deck girder bridge of two spans was selected.

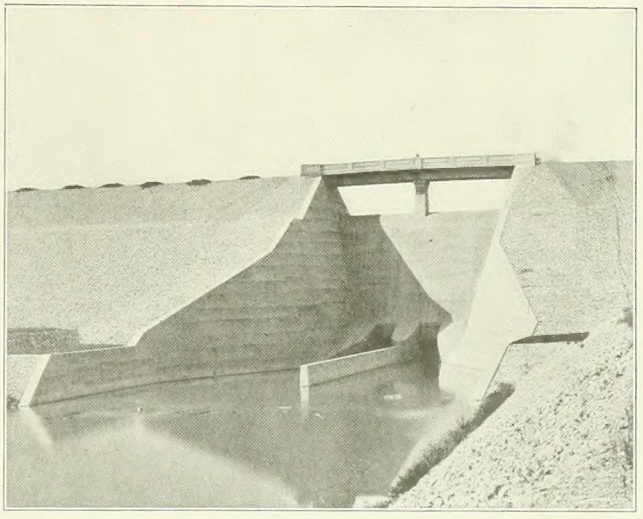


FIG. 342.—THE COMPLETED OUTLET STRUCTURE SEPTEMBER 28, 1921.

The bridge is designed to take a "live" load of two twenty-ton motor trucks passing each other, an impact or blow equal to thirty per cent of the live load, and the dead weight of the bridge itself.

Due to an optical illusion, a bridge built on a straight line looks as though it sags in the middle.

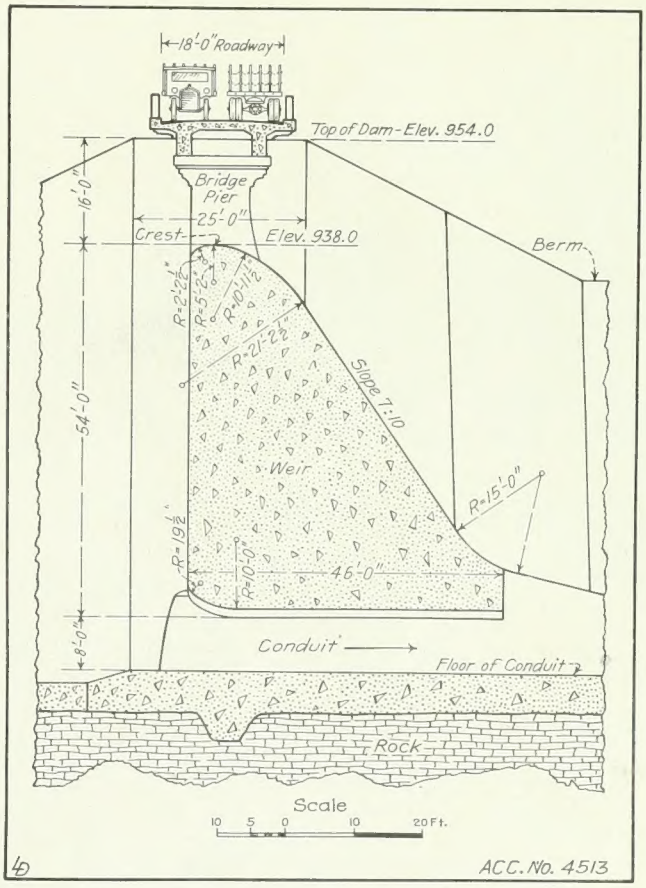


FIG. 343.—SECTION THROUGH WEIR AND BRIDGE.

Therefore this bridge is built on a vertical parabolic curve; that is, it has a hump in the middle. Besides this curve the girders themselves are one inch higher in the middle than at the ends. This is called camber in engineering terms and is put in to take care of deflection or sag in the girders.

The same screening and mixing plant was used that was built for the construction of the outlet works. A guy derrick, placed in the inlet channel, handled the forms and materials. The concrete was brought from the mixing plant to the derrick in bottom-dump buckets, placed on narrow-gauge cars which were pulled by a gasoline locomotive.

The bridge was designed to meet the unusual conditions imposed by its location and the service required of it, and, with its overhanging floor slab and cantilever pier, presents some novel features. In an early issue of the Bulletin the design of this bridge, together with the other spillway bridges, will be discussed at some length.

The Core Pool Overflows at Englewood

On the night of October 25th the core pool on the Englewood dam overflowed on the upstream side of the dam, at a point several hundred feet west of the outlet conduits, and directly west of the gravel-washing plant. The dam was within twelve feet of the top, consequently the pool was quite narrow; it was also very shallow, but its great length (4,600 feet) made the volume of water in it large enough to wash a gully down the slope of the dam. All of the water in the pool ran out of the gap.

This kind of an accident is not unusual in hydraulic work. In this case, only a minor delay of a few days occurred until the washout could be shut off from the rest of the dam by means of low dikes, when pumping was resumed. The wash in the slopes is rapidly being filled up, and at the time this is written (November 1st) repairs will be completed within two or three days.

FIG. 344.—CHUNKS OF CORE MATERIAL AT LOWER END OF WASH, OCTOBER 26, 1921.

An unusual opportunity was afforded to study the condition of the core material, after it had been in place for some time. The upper edge of the wash exposed about 30 feet, in vertical depth, of the core. The material was so firm that it stood up in a vertical wall, almost as if it had been cut down with a great knife. See Fig. 345. It also resisted the rush of the water extremely well, and little of it was washed away. What did go, went in chunks, many of which did not break up much on their trip down the gully. Some of the lumps on top of the gravel debris at the foot of the gully measure over a cubic yard in size. It is very likely that several inches of very soft stuff on top, in the immediate vicinity of the hole, went out with the water, but if any did go, it was so small an amount that it could not be missed. Out of 6,000 or 7,000 cubic yards of material washed out, only about 750 cubic yards was core.

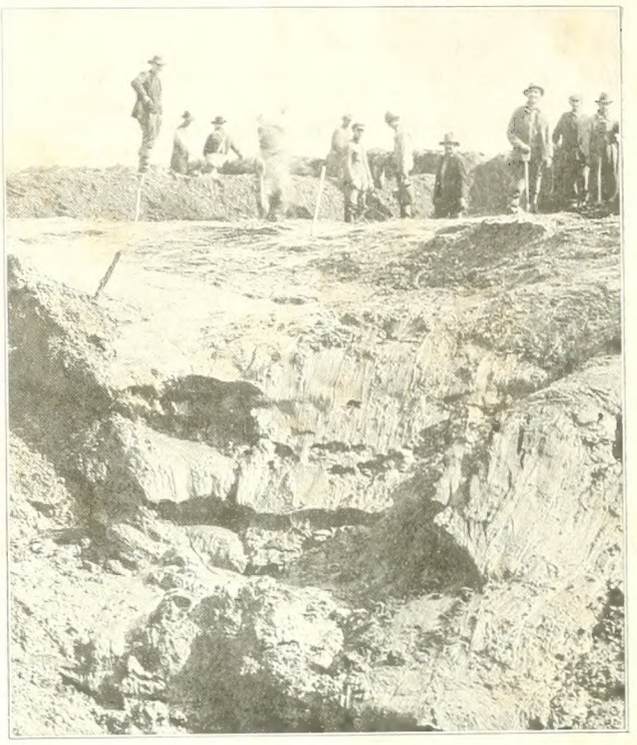


FIG. 345.—CORE EXPOSED AT ENGLEWOOD, OCTOBER 26, 1921.

The core resisted the rush of water extremely well. The face is standing nearly vertically and looks as if it had been cut with a great knife.

The evidence produced by the wash was ocular proof of the satisfactory deposition and consolidation of the core material in the District's dams, and was, of course, far better proof than any that has been secured heretofore from sounding and sampling. When the test came, the core "toed the mark" far better, in fact, than was generally expected.

Four Engineers Leave

Upon the completion of the Lockington dam in September, Mr. Barton M. Jones, division engineer in charge, went to Pueblo, Colorado, to assume charge of the flood prevention investigations in progress there, under the direction of the Morgan Engineering company. He was accompanied by Mr. W. J. Smith, assistant engineer, first on the Lockington dam and then on the Taylorsville dam. Mr. A. L. Pauls, division engineer at Germantown, left on October 1st to assume charge of a difficult foundation job for a viaduct at Decatur, Illinois. In October, Mr. C. O. Shively, assistant division engineer on the Germantown dam, and later at Taylorsville dam, left the employ of the District to accept a position on the teaching staff of Purdue University. All four men were among the oldest employees of the District, in point of years of service. Their departure emphasizes the fact that in a few months the greater part of the work will be done, and the organization in which its members have had so much pride, will be dispersed.